REMARKS

This application has been reviewed in light of the Office Action dated January 5, 2010. Claims 1-7 are presented for examination, of which Claims 1 and 7 are in independent form. Claims 1, 6 and 7 have been amended to define more clearly what Applicant regards as his invention. Favorable reconsideration is requested.

Applicant wishes to thank the Examiner for conducting a telephonic interview on January 14, 2010. Applicant adopts the summary of the interview set out in the Examiner's paper dated January 27, 2010; in addition, Applicant presented arguments relating to the prior art applied against the claims, along the lines of the comments set out below.

Claims 1 and 4 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 6,417,019 (Mueller et al.), or in the alternative, under 35 U.S.C. § 103(a) as being obvious from, *Mueller*. Claims 2 and 3 were rejected under Section 103(a) as being obvious from *Mueller* in view of WIPO Patent Application Publication 00/12226 (Jones et al.), Claim 5 was rejected as being obvious from *Mueller* in view of U.S. Patent Application Publication 2003/0181122 (Collins, III), Claim 6, as being obvious from *Mueller* in view of U.S. Patent 6,483,196 (Wojnarowski), and Claim 7, as being obvious from U.S. Patent 5,886,401(Liu) in view of *Mueller*. Applicant submits that independent Claims 1 and 7, together with the claims dependent therefrom, are patentably distinct from the cited prior art for at least the following reasons.

Claim 1

Claim 1 is directed to a method for producing a white LED of predetermined color temperature. The method includes determining a wavelength of at least one of an uncoated blue LED or an uncoated UV LED of a plurality of LEDs. The method also includes determining, a single time, a quantity and a concentration of a conversion layer to be applied over the at least one uncoated blue LED or uncoated UV LED based on at least the wavelength determined, wherein the conversion layer includes a color conversion agent, the conversion layer configured to absorb at least one of blue light and UV light, and emit light of longer wavelength. The method further includes coating the at least one uncoated blue or UV LED with a conversion layer having the quantity and the concentration determined in the determining step, wherein the coated LED has the predetermined color temperature.

Applicant points to the first step recited in Claim 1, which is "in a plurality of LEDs that includes uncoated blue LEDs or uncoated UV LEDs, or both, the uncoated blue LEDs or uncoated UV LEDs each having a respective wavelength, the wavelength of the uncoated blue LEDs or uncoated UV LEDs not all being equal, determining a wavelength of the uncoated blue LED or uncoated UV LED of the plurality of LEDs". From the present application it is clear that Applicant means by this language that the wavelength of the uncoated blue or UV LED is found out:

> "[0018] LEDs are produced in wafers. It corresponds to the state of the art that the individual LEDs on the wafer are measured individually with regard to brightness and wavelength (DELTAlamda.<1 nm) (wafer mapping, see production specification of the machine manufacturer, e.g. ASM). This data is then further employed for the following purpose: to select the LEDs, after their separation, into various classes. Alternatively, the optical data of the LEDs can be measured individually, before the application of the color

conversion, by means of a spectrometer (or chromameter).

> "[0019] In the subject invention, the information of the wafer mapping is employed to apply to each LED selectively a specific quantity of color conversion agent. The quantity of color conversion agent is hereby selectively, e.g. by means of appropriate selection of the layer thickness or the concentration (in the case of diluted systems) matched to the LED concerned."

From this description, it is seen that the prior art over which Applicant has provided a significant improvement determined the wavelength of each LED on a wafer of LEDs, with a high precision ($\pm$ 1 nm), and then assigned each LED to a class of applications for which that LED was suitable. According to Applicant's method, and as recited in Claim 1, in contrast, that information is used to guide further processing of the LEDs. In particular, however, Applicant notes that the determining of the wavelength as recited in Claim 1 involves finding out the wavelength of each of the blue or UV LEDs to be processed; no such step is found in *Mueller*.

The portions of *Mueller* cited by the Examiner as disclosing the wavelength determining step do refer to various compositions of LED having certain wavelengths, but there is nothing in *Mueller* to suggest that these wavelengths have been measured, as opposed to the LEDs in question simply being taken from a stock of LEDs that a manufacturer has previously sorted by their wavelengths. The latter, it should be noted, would be a situation with which the present application is not concerned, since Applicant has provided a method of processing LEDs during their manufacture so as to obtain a white-light LED, without the need simply to accept whatever wavelengths the various LEDs in a manufacturing batch may have, and to sort them into classes suitable for various applications based on their actual, as opposed to nominal, wavelength.

Moreover, in *Mueller*, the portions cited by the Examiner as determining LED wavelengths do not appear actually to have to do with specific wavelengths obtained in specific LEDs, but rather with wavelength *ranges* that can be obtained using LED materials of certain compositions ("For example, $Al_xIn_yGA_zN$ based LED emission spectrum 4 peaking at *about* 450 nm *substantially overlaps* $SrGa_2S_4:Eu^{2+}$ excitation spectrum 2 and $CaGa_2S_4:Eu^{2+}$ excitation spectrum 3 [emphases added]." *Mueller,* col. 3, line 64, through col. 4, line 1.).

Claim 1 also recites the further processing of LEDs based on determination of the wavelength of the blue or UV LED(s). That processing according to Claim 1 includes "determining a single time a quantity and a concentration of a conversion layer to be applied over the uncoated blue LED or uncoated UV LED of the plurality of LEDs based on at least the wavelength determined, wherein the conversion layer includes a color conversion agent, said conversion layer configured to absorb at least one of blue light and UV light, and emit light of longer wavelength", and "coating the uncoated LED or uncoated UV LED of a plurality of LEDs, with the conversion layer having the quantity and the concentration determined that single time in said step of determining the quantity or concentration, wherein the coated LED has the predetermined color temperature".

As Applicant understands the outstanding rejection of Claim 1, the Examiner considers that since *Mueller* is manufacturing light sources within the spectral range of 515 – 590 nm, in which the conventional $Al_xIn_yGa_zN$ and $Al_xIn_yGa_zP$ based LEDs show a broad minimum in efficiency, with little or no blue shift appearing with increasing the drive current, and discusses applying a color conversion material, and then "fine-tuning" the applied layer to bring the applied amount or concentration in line with the

desired amount or concentration. From this, the Examiner considers that one using the *Mueller* approach would necessarily determine the desired conversion layer thickness, or concentration, in advance of applying it, and considers that this meets the second determining step of Claim 1. As shown above, however, Applicant claims, in Claim 1, a method in which the quantity and concentration of the conversion layer is determined based on the individual wavelengths of the respective LEDs, as determined in the first-recited determining step. Applicant does not understand anything in *Mueller* as teaching or suggesting that any part of the processing in that patent is based on individual characteristics of respective uncoated LEDs, as in the method of Claim 1. Nothing in that patent discusses such measurements or observations of individual LEDs, or determining or considering "respective wavelengths" of the LEDs. The Examienr is kindly reminded that "'A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)." MPEP § 2131. Applicant submits that nothing in Mueller teaches, or even hints at, the wavelength determining step of Claim 1, much less the second determining step and coating step, both of which, as recited, are performed in a way that depends on the presence of the wavelength determining step.

For at least these reasons, Claim 1 is believed to be allowable over *Mueller*.

<u>*Claim 7*</u>

Claim 7 is directed to a white LED light source, comprising a plurality of blue LEDs or UV LEDs, and, above each of said LEDs, a conversion layer. According to

Claim 7, the conversion layer has a thickness, above a particular one of the blue or UV LEDs, that is proportional to a determined wavelength of that particular blue or UV LED.

By virtue of the features of Claim 7 each LED of the plurality of LEDs in the white light source is covered by a conversion layer and the thickness of that layer is proportional to a determined wavelength of the respective LED. Such a determination of the wavelength can be made, for example, by measuring the emission spectrum of each LED.

Claim 7, therefore, like Claim 1, provides for a conversion layer whose thickness is based on the actual wavelength of each individual one of the blue or UV LEDs.

Liu is related to a packaging structure for LEDs with enhanced optical output coupling efficiency, improved thermal management, and two dimensional LED arrangements with improved packaging density via direct interconnections of the LEDs. A phosphor layer 125 covers the bottom side (outer surface) of a substantially transparent epoxy substrate piece 124, in which the plurality of LEDs 114 are incorporated. On the top of the substrate 124 a polymer layer 118 is applied, where the back side contacts are deposited as metallization 122, and electrically bonded through vias 120 to the LEDs' interconnect contact pads 116, 117, as shown for example in array 2, illustrated in Fig. 2, and described in col. 3, lines 33 to 47. Apparently, the applied phosphor layer 125 has a <u>uniform</u> thickness with a <u>constant</u> composition over the plurality of LEDs 114 of the array 2.

The Office Action cites col. 3, lines 39-44 as allegedly teaching or suggesting that the thickness of the layer 125 is proportional with a determined wavelength of the blue or UV LED concerned. That paragraph states:

> "A phosphor layer 125 can be coated to the outer surface of epoxy compound 124 to convert the emission to different colors or to white light by color mixing. The appropriate thickness of the phosphor layer will depend on the colors of LED and the absorption properties and thicknesses of the phosphors. With this packaging structure, for a die size of 500 micrometer x 500 micrometer, a packaging density of 20 devices per linear centimeter and 400 devices per square centimeter can be achieved." Col. 3, lines 39-47.

While this paragraph may state that a phosphor layer 125 is provided to convert the color of the light produced by the device, Applicant strongly disagrees with any assertion that anything in this (or any other) portion of *Liu* teaches that the thickness or other characteristics of the layer vary from one LED to another. Moreover, since as shown above *Mueller* also contains no teaching or suggestion to determine the respective wavelength of individual blue or UV LEDs, and provide a conversion layer whose characteristics, such as thickness, vary based on the actual wavelength of each of those LEDs, it is believed plain that a person of ordinary skill could not have been led to the structure recited in Claim 7 by *Liu* and *Mueller*, taken separately or in any possible combination.

A review of the other art of record has failed to reveal anything that, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as applied against the independent claims herein. Therefore, those claims are respectfully submitted to be patentable over the art of record.

The other rejected claims in this application depend from Claim 1 discussed above and, therefore, are submitted to be patentable for at least the same reasons as is that respective claim. Because each dependent claim also is deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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